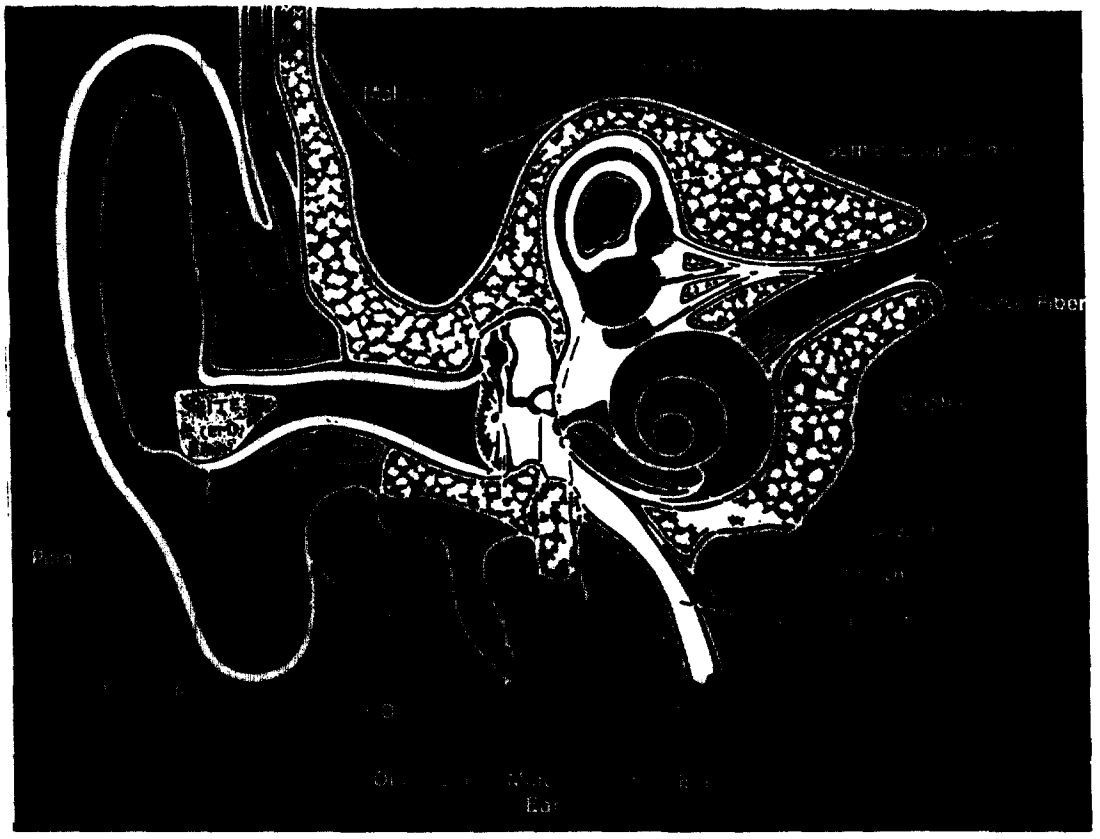
Research Program - Hearing Aid Compatibility

HUMAN EAR AND HEARING AID LOCATION



BTE - Behind-the-ear with EM (ear mold)

ITE - In-the-ear

ITC - In-the-canal

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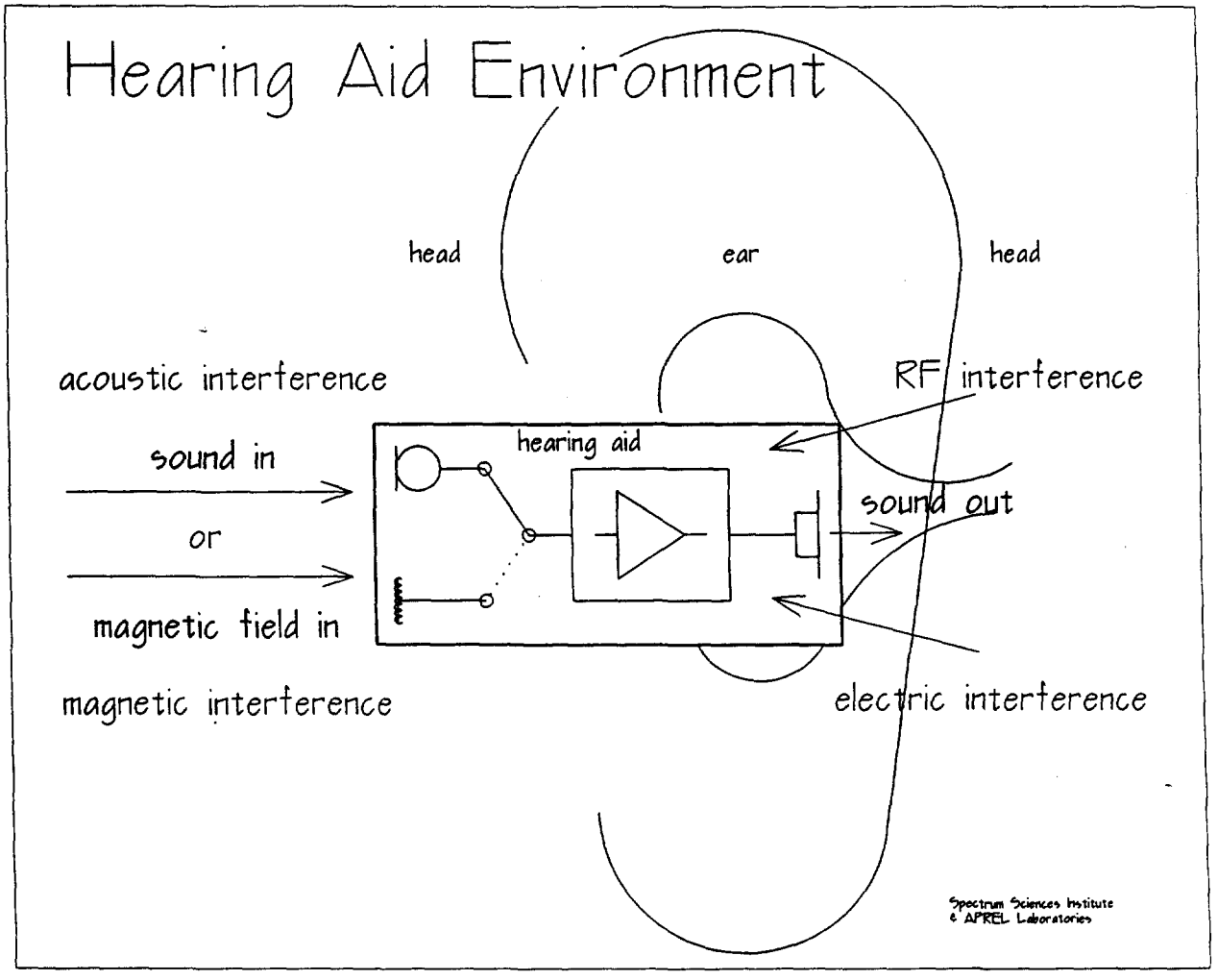
HEARING AID ENVIRONMENT



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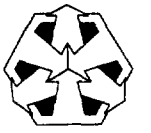
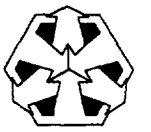


THE FACTS ABOUT RF INTERFERENCE from analog and digital wireless telephones

Demodulation product	Possible interference symptom	Remarks
DC larger than bias	blocking*	all technologies
DC smaller than bias	change of G(f)**	all technologies
High peaks or pulses	change of G(f)**; "static"	all technologies
AF with periodic regularity	"buzzing"	typical to TDMA
AF without regularity, or random	noise; "random buzz"; "static"	typical to CDMA
AF IMP (intermodulation products)	Noise; "static"; distortion	all technologies

- * blocking hearing aid inoperative
- **G(f) gain (volume) as function of frequency
- DC direct current
- AF audio frequency
-



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APREL Labs TEST PROTOCOL PP-HAC 12

Experiment is based on equalization of "buzz" loudness to level considered by previous studies as not annoying (55 dB IRIL). In case of "not annoying" distance being too short, the distance "not detectable" (45 dB IRIL) is examined. Experiment uses parametric averaging taking in account RF immunity level of hearing aid. Measurements of equal loudness distances are repeated at various (2-3) power levels (when applicable

Number of subjects 10 hearing aid users (minimum)

Speech (acoustically balanced) tape is played at 65 dB (A) from the Standard Sound Source. Hearing aid gain set up by user for comfortable listening level.

Acoustic "buzz" reference recording of PCS like square wave audio signal is played back from the Standard Sound Source at level set to 55 dB (A) in anechoic room, loudspeaker positioned 1 meter from listener head.

Horn antenna placed on concha axis and radiating 1900 MHz CW amplitude modulated with PCS envelope., RF level is varied to the level at which loudness of interference is equal to loudness from acoustic source.

PCS handset is placed in the proximity of head; search for distances and angles at which loudness of interference equals loudness from acoustic source.

Horn radiated RF signal determines order of magnitude of HA immunity.

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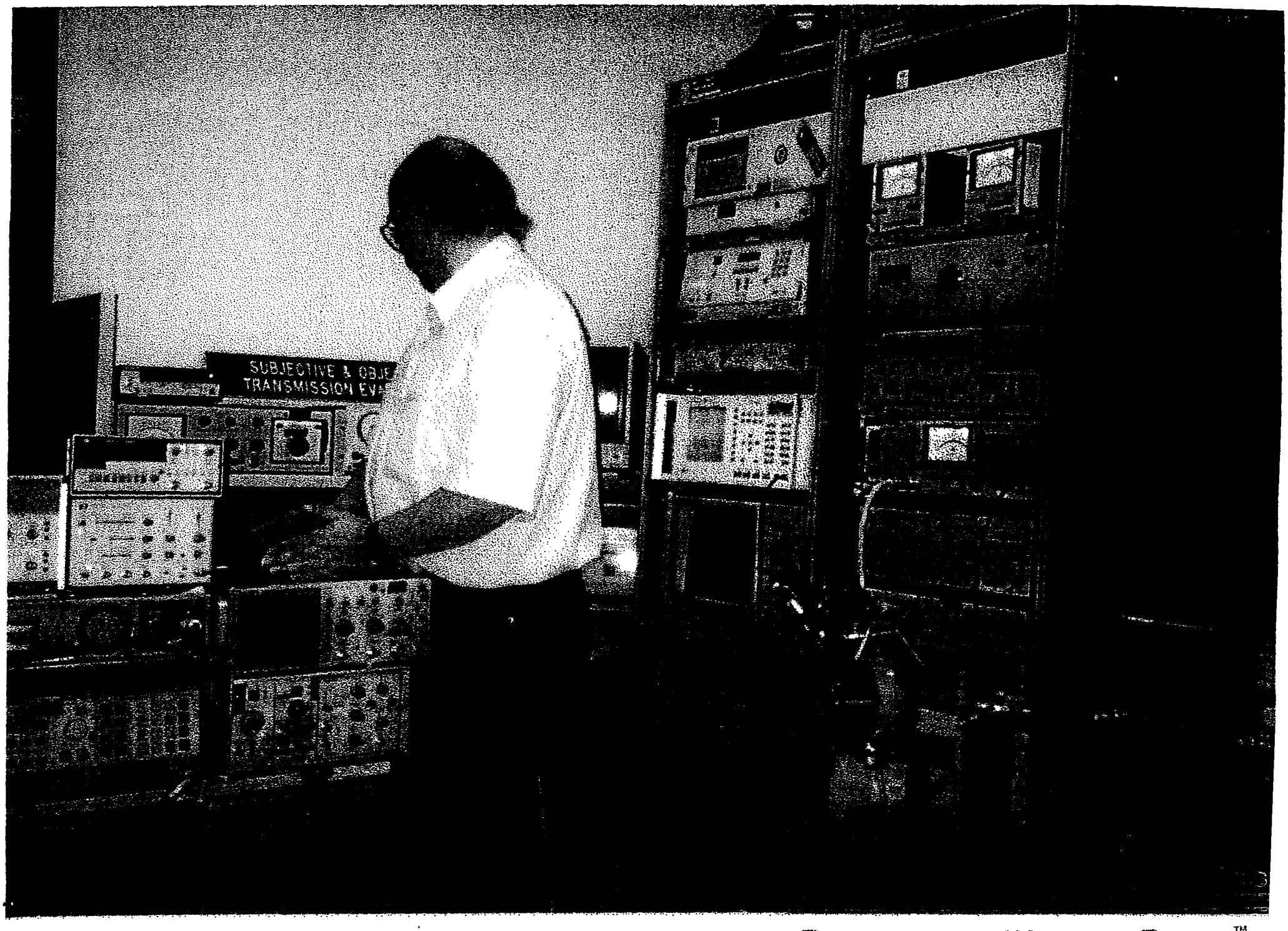

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Research Program - Hearing Aid Compatibility

THE FACTS ABOUT BYSTANDER INTERFERENCE FOR ERICSSON PCS 1900 CH 337 PHONE

Table 1

Summary of results							
Subject			Hearing Aid		RF Interference		
Sex	Age	Ear	Type	RUI 55	DT	Blocking	55 dB IRIL
M	51	L	**BTE**	15 V/m	30 cm	N.P.	**5 cm**
M	47	R	**BTE**	17 V/m	20 cm	N.D.	**10 cm**
M	69	L	**BTE**	-	0 cm	N.D.	**N.D.**
F	70	L	**BTE**	-	*40 cm*		***10 cm***
F	70	R	**BTE**	-	-		***15 cm***
M	57	L	**ITE**	*305 V/m*	15 cm	N.D.	**N.D.**
M	68	L	**ITE**	40 V/m	20 cm	N.D.	**0 cm**
M	68	R	**ITE**	*200 V/m*	10 cm	N.D.	**0 cm**
M	51	R	**ITE**	*80 V/m*	25 cm	N.D.	**4 cm**
M	47	L	**ITE**	*90V/m*	5 cm	N.D.	**N.D.**
M	72	R	**ITE**	34 V/m	20 cm	N.D.	**15 cm**
M	61	L	**ITE**	*121 V/m*	30 cm	N.D.	**5 cm**
F	31	R	**ITE**	49 V/m	40 cm		**10 cm**
M	75	L&R	**ITE**	34 V/m	0 cm		**N.D.**
M	57	L&R	**ITE**		*11 cm*		***4 cm***

N.D. not detected
N.P. not performed
italic: *extrapolated results*
RUI55 real user immunity at 55 dB IRIL
55 dB IRIL per IEC 118-13

APREL Laboratories, March 1996

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